



-1-

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Yuji ISODA

Serial No.: 10/761,238 Group Art Unit: 2878

5 Filed: January 22, 2004 Examiner: GABOR, OTILIA

For: PREPARATION OF STIMULABLE PHOSPHOR SHEET

The Honorable Commissioner of Patents  
and Trademarks, Washington, D.C. 20231

10

DECLARATION PURSUANT TO RULE 132

I, Yuji ISODA, am the inventor/applicant of the subject patent application.

15

I hereby solemnly and sincerely declare that:

1. I am familiar with the prosecution history of the above-identified patent application.

20

2. I now submit comparative experimental data which are described in Japanese Patent Application No. 2000-299003 for which the convention priority is claimed in the patent application.

25

[Example I]

(1) Preparation of phosphor material for deposition  
Cesium bromide (CsBr, 100 g, 0.47 mol.) and europium bromide (EuBr<sub>3</sub>, 1.8404 g, 4.7x10<sup>-3</sup> mol.) were mixed and  
30 pulverized in a mortar, and then processed in a stirring vibrator for 15 min. The resulting mixture was placed in a heating furnace. The gas contained in the furnace was evacuated for 3 minutes, and a nitrogen gas was introduced into the furnace. The mixture was fired in the furnace at 525°C for 2 hours. The furnace was then evacuated for 15 minutes, after the firing was complete.

BEST AVAILABLE COPY

-2-

The resulting stimulable europium activated cesium bromide ( $CsBr:0.01Eu$ ) phosphor was pulverized in a mortar, and the pulverized phosphor was compressed at  $800 \text{ kg/cm}^2$ , to produce a pellet for deposition. The pellet  
5 was then placed in an evacuating vessel at  $150^\circ\text{C}$  for 2 hours, for degassing.

(2) Deposition of phosphor material on support  
A support comprising a quartz frame united to a quartz sheet (numeral 1 of Figures 1A, 1B, and 1C.  
10  $a=c=d=f=20 \text{ mm}$ ,  $g= 500 \mu\text{m}$ ,  $b \times e=40 \text{ cm} \times 40 \text{ cm}$ ,  $h=10 \text{ mm}$ ) was prepared.

In a depositing apparatus, the support and the phosphor pellet produced above were placed in the predetermined positions. The apparatus was evacuated to reach a  
15 pressure of  $3.0 \times 10^{-6} \text{ Pa}$ .

To the phosphor pellet was applied an electron beam from an electron gun at 60 W and at an accelerating voltage of 4.0 kV for 20 minutes, whereby depositing a stimulable phosphor on the support in the area enclosed  
20 with the frame at a deposition rate of  $25 \mu\text{m/min}$ .

After the deposition was complete, the application of electron beam was ceased, air was introduced into the apparatus, and the support was taken out of the apparatus.

25 It was observed that columnar phosphor crystals vertically were deposited on the support to form a stimulable phosphor layer (numeral 2 of Fig. 1A) of approx.  $480 \mu\text{m}$  thick. The length and width of the columnar crystal is approx.  $480 \mu\text{m}$  and approx.  $10 \mu\text{m}$ , respectively.

30 Thus, a stimulable phosphor sheet composed of a support and a deposited stimulable phosphor layer was prepared.

(3) Preparation of protective layer  
Silicon dioxide ( $SiO_2$ ) was deposited on the stimulable phosphor layer and the top of the frame in the same manner to form a protective  $SiO_2$  glass layer (numeral 3 of

-3-

~~BEST AVAILABLE COPY~~  
~~BEST AVAILABLE COPY~~

Fig. 1A).

Thus, an air-tightly sealed stimulable phosphor sheet (Figures 1A, 1B, 1C) of the invention was manufactured.

5

[Comparison Example 1]

The procedures of Example 1 were repeated except for replacing the support having the frame (Fig. 1A) with a simple quartz sheet (thickness: 10 mm) and depositing SiO<sub>2</sub> 10 on the stimulable phosphor layer and the periphery of the quartz sheet, to manufacture a sealed stimulable phosphor sheet (Fig. 2A) having a quartz sheet (51), a stimulable phosphor layer (52) and a protective glass layer (53).

15

[Comparison Example 2]

The procedures of Example 1 were repeated except for replacing the support having the frame (Fig. 1A) with a simple quartz sheet (thickness: 10 mm). Subsequently, a separately prepared spacer (width: 20 mm, height: same as 20 the height of the phosphor layer) was fixed to the periphery of the quartz sheet, and then a polyethyleneterephthalate sheet (thickness: 50 μm) was fixed to the upper surface of the stimulable phosphor layer and the top of the spacer via adhesive, to manufacture a sealed stimulable phosphor sheet (Fig. 3A) having a quartz sheet (61), 25 a stimulable phosphor layer (62) and a protective layer (63).

[Comparison Example 3]

30 The procedures of Comparison Example 2 were repeated except for depositing SiO<sub>2</sub> glass layer on the stimulable phosphor layer and the spacer in place of fixing the polyethyleneterephthalate sheet to the stimulable phosphor layer and the spacer via adhesive, to manufacture a 35 sealed stimulable phosphor sheet (Fig. 3A) having a quartz sheet (61), a stimulable phosphor layer (62) and a

-4-

BEST AVAILABLE COPY

protective layer (63).

5



Fig. 1A

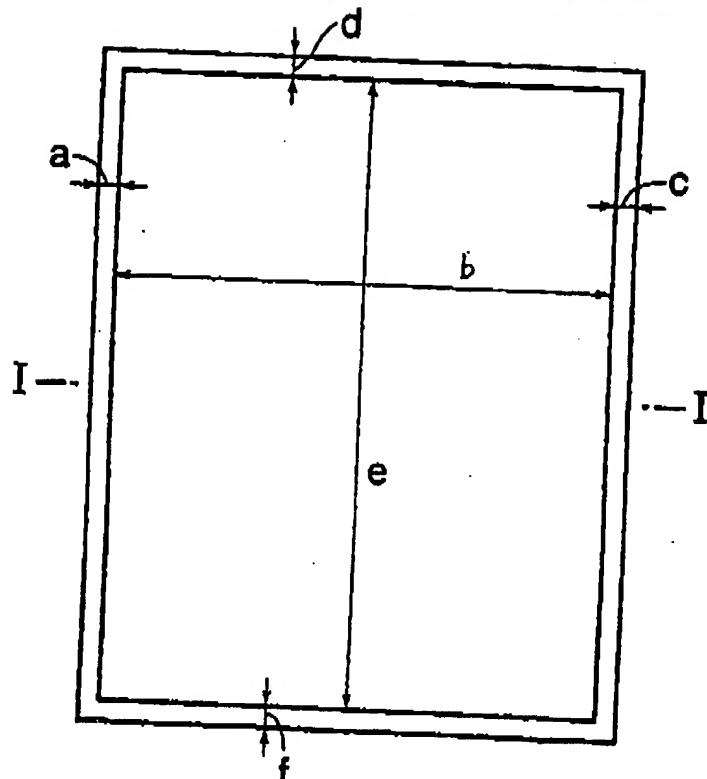


Fig. 1B

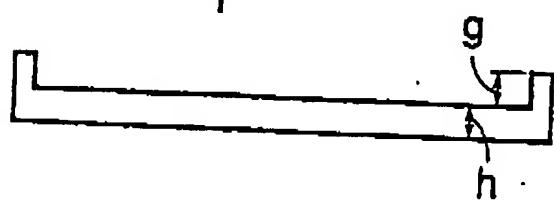


Fig. 1C



Fig. 2A



Fig. 3A

-5-

## BEST AVAILABLE COPY

## [Evaluation of Moisture Resistance]

Each of the sealed stimulable phosphor sheets manufactured in Example 1 and Comparison Examples 1 to 3 was evaluated in its moisture resistance by the following methods.

The sealed stimulable phosphor sheet was placed in a room kept at 40°C, 80%RH for one week. The amount of stimulated emission emitted from the stimulable phosphor sheet was measured according to the known radiation image recording and reproducing method just before and just after the sealed stimulable phosphor sheet was placed in the room, and the measured amounts were compared. The results of comparisons are marked according to the following criteria:

- A: Stimulated emission decreases by less than 5% after the moisture resistance test
- B: Stimulated emission decreases by 5 to 10% after the moisture resistance test
- C: Stimulated emission decreases by more than 10% after the moisture resistance test

## Moisture Resistance

25

Example 1

A

30

Comparison Example 1	B
Comparison Example 2	C
Comparison Example 3	C

## [Observation of Experimental Results]

In my understanding, the stimulable phosphor sheet of Comparison Example 1 embodying the stimulable phosphor sheet of Arakawa et al. (U.S. Patent 6031236) which is outlined by the Examiner in the Office Action at page 3. Apparently, the moisture resistance of the stimulable

**BEST AVAILABLE COPY**

-6-

phosphor sheet of the invention is higher than the moisture resistance of the stimulable phosphor sheet of Arakawa et al.

5       3. I further declare that all statements made herein of my own knowledge are true and that all statement made on information and belief to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are  
10 punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and the such willful false statements may jeopardize the validity of the application or any patent resulting therefrom.

15

Date: November , 2004 By: \_\_\_\_\_

Yuji ISODA